

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : GAD ASSAF Docket No. : 96-204
Serial No. : Examiner :
Filing Date: Art Unit :
For : HEAT PUMP SYSTEM AND METHOD
FOR AIR-CONDITIONING

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Suite 1201
New Haven, CT 06510-2802

PRELIMINARY AMENDMENT

Hon. Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, D.C. 20231

Dear Sir:

Preliminary to examination of the above-identified and
accompanying reissue patent application, please amend the
claims of the original United States issued patent by
adding the following claims:

IN THE CLAIMS

Please add the following new claims.

--29. A heat pump system, comprising:

two units in fluid communication with each other, each
unit including:

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a housing, an air/brine heat exchanger, a brine/refrigerant heat exchanger, brine inlet means for applying brine onto at least one said heat exchangers, a brine reservoir and means for circulating said brine from the reservoir to said inlet means;

said brine/refrigerant heat exchangers of said units being in closed loop fluid communication with each other and having compressor means for circulating a refrigerant therethrough in selected directions.

30. A heat pump system, comprising:

two units in fluid communication with each other, each unit including:

a housing, brine inlet means at the top portion thereof, a first heat exchanger located adjacent said brine inlet means, a brine reservoir at the lower part of said housing, and means for introducing air into brine-dripping space delimited between said first heat exchanger and said reservoir, and

a second heat exchanger in liquid communication with said brine inlet means and said reservoir;

said second heat exchangers being enclosed loop fluid communication with each other and having compressor means

for circulating a refrigerant therethrough in selected directions, and

means for circulating brine between said reservoir and said second heat exchanger of each unit.

31. The heat pump system as claimed in claim 29, wherein the reservoirs of each unit are in liquid communication with each other.

32. The heat pump system as claimed in claim 31, further comprising means for circulating brine between said reservoirs.

33. The heat pump system as claimed in claim 31, further comprising a third heat exchanger affixed on brine circulating pipes, interconnecting said reservoirs.

34. The heat pump system as claimed in claim 32, wherein said means for circulating the brine between said reservoirs are adapted to circulate brine at a lower rate than the rate of circulation of the brine between said two reservoirs and said brine inlet means.

35. The heat pump system as claimed in claim 32, wherein said means for circulating the brine between said reservoirs are adapted to circulate brine at a lower rate than the rate of circulation of the brine between said two reservoirs and said second heat exchanger of each unit.

36. The heat pump system as claimed in claim 29, wherein at least said unit and said second and third heat exchangers are made of materials non-corrosive to brine.

37. The heat pump system as claimed in claim 29, further comprising a throttle valve affixed on a refrigerant-carrying pipe interconnecting said second heat exchangers.

38. The heat pump system as claimed in claim 29, wherein at least one of said reservoirs is further provided with water inlet means for adding water to the brine.

39. The heat pump system as claimed in claim 29, further comprising ambient air heating means for heating the ambient air prior to the introduction thereof into said housing.

40. The heat pump system as claimed in claim 39,
wherein said heating means is a water/air heat exchanger.

41. The heat pump system as claimed in claim 29,
further comprising an external humidity source for adding
humidity to ambient air introducible into said housing.

42. The heat pump system as claimed in claim 41,
wherein said humidity source is a plant.

43. A method for air conditioning, comprising:
providing a heat pump system as claimed in claim 29
and further including a refrigerant evaporator and a
refrigerant condenser, wherein the refrigerant evaporator
and the refrigerant condenser exchange heat with brine
solution, whereby the temperature of condensation of said
refrigerant is reduced while the temperature of said
evaporator is raised, thereby increasing the efficiency of
the system.

44. The method as claimed in claim 43, wherein said
first heat exchanger is thermally associated with said
refrigerant evaporator.

45. The method as claimed in claim 43, wherein said first heat exchanger is thermally associated with said refrigerant condenser.

46. The method as claimed in claim 43, wherein said means for circulating the brine between said reservoirs is adapted to circulate brine at a lower rate than the rate of circulation of the brine between said two reservoirs and said brine inlet means.

47. The method as claimed in claim 43, wherein said means for circulating the brine between said reservoirs is adapted to circulate brine at a lower rate than the rate of circulation of the brine between said two reservoirs and said second heat exchanger of each unit.

48. A dehumidifier system comprising:

a dehumidifying chamber into which moist air is introduced and from which less moist air is removed after dehumidification;

a desiccant solution situated in at least one reservoir;

a first conduit via which desiccant solution is transferred from the at least one reservoir to the

dehumidifying chamber, said solution being returned to said at least one reservoir after absorbing moisture from the moist air;

a regenerator which receives desiccant solution from said at least one reservoir and removes moisture from it;

a second conduit via which desiccant is transferred from the at least one reservoir to the regenerator, said solution being returned to said at least one reservoir after moisture is removed from it; and

a heat pump that transfers heat from the solution in the first conduit to the solution in the second conduit.

49. A dehumidifier system comprising:

a dehumidifying chamber into which moist air is introduced and from which less moist air is removed after dehumidification;

a desiccant solution situated in a first reservoir;

a first conduit via which desiccant solution is transferred from the first reservoir to the dehumidifying chamber, said solution being returned to said at least one reservoir after absorbing moisture from the moist air;

a desiccant solution situated in a second reservoir;

a regenerator which receives desiccant solution from the second reservoir and removes moisture from it;

a second conduit via which desiccant is transferred from the second reservoir to the regenerator, said solution being returned to said second reservoir after moisture is removed from it; and

wherein a substantial temperature differential is maintained between the first and second reservoirs.--.

R E M A R K S

This amendment is submitted so as to present broadening claims to the accompanying reissue application, and further to present claims which have been copied from published PCT Publication No. WO 99/26026, which names an Applicant/Assignee as Drykor Ltd., and which names Mordechai Forkosh, et al., as inventors. A copy of this PCT Publication is enclosed with the accompanying Information Disclosure Statement.

The present Preliminary Amendment adds new independent claims 29 and 30 which correspond to originally-filed claims 1 and 2 without the requirement that the two units be substantially the same or identical. The specification shows two units, and does not present any teaching wherein the units must be identical. The claims have therefore been broadened in this respect. Support for these claims is shown in the specification generally, and at least in

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claim 1 as originally filed, Figures 1-3, and numerous other locations in the application.

Dependent claims 31-47 provide proper dependencies from new claims 29 and 30.

New independent claims 48-49 correspond exactly to claims 1 and 12 as published in the aforesaid PCT Patent Publication No. WO 99/26026, which designated the United States. It is believed that a United States patent application is pending, and the PCT Search Report indicates that at least some claims therein were considered patentable by the PCT Examiner. Thus, these claims have been copied into this reissue application with the intent of provoking an interference with any pending U.S. patent application counterpart to the aforesaid PCT Publication No. WO 99/26026.

Added independent claim 48 corresponds to published claim 1 from the PCT application. This claim recites a dehumidifier system. The apparatus of the present application is claimed as a heat pump, but also serves as a dehumidifier system for removing moisture from a stream of air.

Claim 48 recites a dehumidifying chamber into which moist air is introduced and from which less moist air is removed after dehumidification. This is shown, for example

in Figure 1, wherein air is introduced by blowers 20, 20' and exits from the top of the housing. As set forth in the specification, one unit 4, 6 is used as a condenser and the other is used as an evaporator. Thus, in one unit, moist air is introduced and exits in dryer form.

Claim 48 next recites a desiccant solution situated in at least one reservoir. The present application refers to brine, for example hygroscopic brine such as LiBr, $MgCl_2$, Ca_2Cl , and mixtures thereof, in column 1, lines 59-60. These are all desiccant solutions, and they are positioned in reservoirs 14, 14' as shown in the drawings.

Claim 48 next recites a first conduit via which desiccant solution is transferred from the reservoir to the dehumidifying chamber, said solution being returned to said at least one reservoir after absorbing moisture from the moist air.

Turning to the present application, conduit 26, 26' removes brine or desiccant solution and transfers it to nozzles 10, 10' for introduction to the dehumidifying chamber. Further, after the solution travels through the dehumidifying chamber, it returns to reservoirs 14, 14'.

Claim 48 next recites a regenerator which receives desiccant solution from the reservoir and removes moisture from it. This function is provided by the other of the two

units of the present application, which serves as the evaporator.

Claim 48 next recites a second conduit via which desiccant is transferred from the at least reservoir to the regenerator said solution being returned to said at least one reservoir after moisture is removed from it. This structure is disclosed as the other of pipes 26, 26' which corresponds to the unit being operated as an evaporator. Further, in this unit, the solution travels through section 12, 12' and returns to the reservoir 14, 14'.

Claim 48 finally calls for a heat pump that transfers heat from the solution in the first conduit to the solution in the second conduit. This heat pump is shown in the present application, for example in Figure 1, as heat exchangers 36, 36' and conduits 40, 42 which serve to transfer heat from the solution in one conduit to the other.

Thus, claim 48 corresponding to claim 1 as published in the aforesaid PCT application is clearly supported and can properly be added in this application. As set forth in the inventor's declaration, this claim was not originally introduced in the application through error, in that a claim of this scope was not appreciated by the applicant as being patentable, this error was made, on information and

belief, without deceptive intent, and has been corrected with diligence.

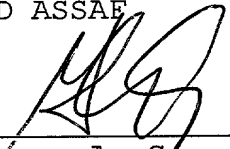
Turning to claim 49 added herein, this claim corresponds to published claim 12 of the aforesaid PCT application. This claim recites a dehumidifier system substantially as in claim 48, and support for this subject matter is found where identified above. Claim 49 differs from claim 48 by indicating that a substantial temperature differential is maintained between the first and second reservoirs (of desiccant solution).

Reservoirs 14, 14' of the heat pump of the present application are likewise taught as being at substantially different temperatures.

Enclosed herewith is a check in the amount of \$727.00,
which covers the reissue filing fee as well as an
additional claim fee in connection with the additional
independent claims added herein. If any additional fees
are due, please charge same to Deposit Account No. 02-0184.

Respectfully submitted,

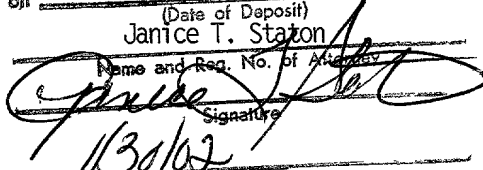
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Signature
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